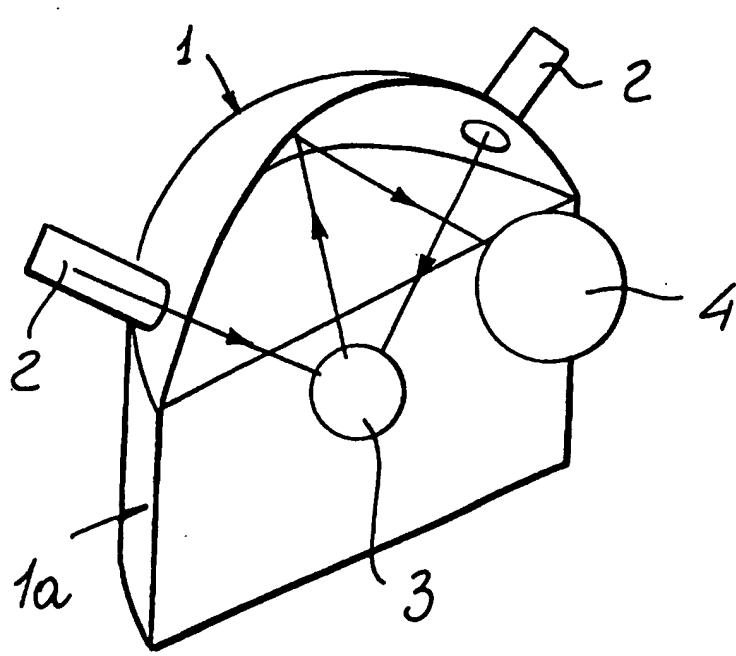


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| <p>(54) Title: <b>THREE-DIMENSIONAL VIRTUAL IMAGE PROJECTOR IN PARTICULAR FOR PROJECTING THE THREE-DIMENSIONAL IMAGE OF AN OBJECT THROUGH THE AIR NEAR SAID OBJECT</b></p> <p>(57) Abstract</p> <p>An improved construction for projecting three-dimensional virtual images floating through the adjoining air comprises means for coherently illuminating a real object and means for reflecting the image of the object so that the image can be seen in the environment encompassing the real object, such as outside of a shop display window.</p>  |                  |  |

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**THREEDIMENSIONAL VIRTUAL IMAGE PROJECTOR IN PARTICULAR FOR  
PROJECTING THE THREEDIMENSIONAL IMAGE OF AN OBJECT THROUGH  
THE AIR NEAR SAID OBJECT**

**BACKGROUND OF THE INVENTION**

The present invention relates to an improved construction for projecting threedimensional virtual images through the air in front of said construction and, in particular, it relates to a projector for projecting through the air in front of a display window of a shop or the like, the fixed or movable image of a real object.

The invention substantially consists of a spatial projector for projecting threedimensional images floating through the air, and is mainly designed for drawing the attention of persons by displaying to them, suspended through the air, a threedimensional image of an object or article such as a toy, a jewel, a footwear article or any other articles related to the market field of a set shop or the like. In this connection it should be apparent that the object the threedimensional image of which must be projected through the air in front of the projector may also be not directly related to a given shop, but it can also constitute an advertising appeal for a museum, an exhibition, fair, art gallery and a lot of different traffic places such as subways, airports, stations, autogrill's, and so on.

The requirements of providing means specifically designed for drawing the attention of persons, considered as potential buyers of the articles being sold in a shop,

has brought to make signs, as well as in-window exhibitions, as appealing as possible. Anyhow, it has been found that the exhibition of well exposed to view articles can be much more "appealing" than the provision in a shop window of a lot of articles.

The Applicant of this application has already designed and made a glass frame-exhibition cabinet to be applied inside the glass of the display window of a shop, for properly "insulating" and exhibiting some appealing articles specifically provided for drawing thereon an initial attention.

A further step provided for drawing the attention of moving persons has been that of designing a product suitable to approach a moving person, i.e. a product able to exit a shop display window, at least with its image, to "catch" the attention of a moving person.

The prior art includes numerous examples of attempts to draw public attention.

For example in U.K. Pat. No. 378 means are provided for giving an aerial image of an inscription like a signboard or billboard using a spherical mirror or lens.

U.K. Pat. 248276, WO/PCT 82/00911 and WO/PCT 83/03019 disclose the use of two reflectors arranged at an angle with each other to throw in the sky or in the air an image like a sign of a store.

U.S. Pat. No. 2200959 and 4739567 disclose also reflectors but for projecting and displaying an image like a sign on building display windows.

U.S. Pat. 5214458 shows a display apparatus using a Fresnel lens for projecting images on the surface of a

wall or ceiling.

Each of the foregoing patent references relates, however, to means to throw out signboard image but not the image of the item to display out of the store or out of the shelf.

Some examples of projected signs have been disclosed in the Patent document GB 378/1910, US 5214458, GB 248276, EP 0149635; moreover, the patents US 2200959 and US 4739567 illustrates means specifically designed for projecting the images of articles on the surfaces of the shop window glasses. In other cases, furthermore, one has attempted to project images outside of a shop, as disclosed, for example, in the patent documents WO/PCT 82/00911 and WO/PCT 83/03019, in which are projected marks, and in the case of the construction called "Innovision" and using Fresnel's lenses.

However, all of the above prior apparatus are comparatively complex and expensive, of difficult use and installation and, moreover, they are not suitable to properly project a threedimensional virtual image having a very good quality and very reliable.

#### SUMMARY OF THE INVENTION

Accordingly, the main object of the present invention is to provide market advertising operators and shop managing operators with a simple and unexpensive construction, which moreover can be easily used and assembled, specifically designed for projecting through the air in front of said construction either fixed or movable threedimensional images and which construction, moreover,

can be easily applied to the display window of a shop in order to project an at least article image through the air in front of the display window, at the shop sidewalk.

According to one aspect of the present invention, the above object, as well as yet other objects, which will become more apparent hereinafter, are achieved by the subject construction, comprising a virtual threedimensional image projector, to be applied inside the glass of a shop display window (or supported on any desired support elements), said projector including a reflecting surface for reflecting to the outside a positive image of an object, as obtained by contemporaneously illuminating said object by two concentrated coherent light sources free of any dispersions.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

A preferred embodiment of the construction according to the present invention will be disclosed hereinafter, by way of an indicative but not limitative example, with reference to the accompanying drawings, where:

Figure 1 is a schematic view illustrating the subject projector;

Figure 2 is a side view of the projector shown in figure 1;

Figure 3 schematically illustrates an example of an advertising adhesive sheet which can be applied to a shop display window in order to clearly indicate the projection point; and

Figure 4 is a further schematic view illustrating

the subject projector assembled on the glass of a shop display window.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings, the projector according to the present invention comprises a reflecting surface (DIOPTER), which is made by a vacuum thermoformed dome or cup element made of a brilliant black A.U. polystyrene having an inner mirror-like surface which defines a quarter of sphere parabola including seats 2, 2a for two light sources, each of which is constituted by a halogen lamp (not shown) with a diacropic parabola, each having, preferably though not exclusively, a power of 20 watts, and being simultaneously power supplied under a phase resonance condition by an electronic stransformer (also not shown) having for example a power of 60 watts. The mentioned lamps are provided for concentrating their respective light beams on an article or object 3, supported by a supporting element (not shown) arranged at a bottom portion constituted by an article holding recess 1a; the supporting element, provided for supporting the article or object the image of which must be projected, will be preferably driven by an asynchronous motor (not shown), in order to cause the supported illuminated object to be turned, and to accordingly turn the related image suspended through the air in front of the projector.

As the lamps 2, 2a are switched on, they will illuminate the object 3, and the concentrated light will be reflected by the inner surface of the diopter forming dome 1, and will be sent to the outside so as to form through

the air in front of the projector the threedimensional image 4 of the illuminated object or articles; the image, in particular, will be visible through the outside air with a vision angle of substantially  $90^\circ$ , and the luminosity of said image will be the greater as the smaller is the luminosity of the outer environment.

By varying the distance between the object 3 and the diopter 1, it will be possible to modify the size of the projected image.

In the case in which the subject projector is used on a shop window glass, on the outer surface of the latter, at said projector, an advertising adhesive sheet element can be applied, said sheet element including a transparent or clear region 6 in order to clearly indicate the projection point.

In this connection it should be apparent that, by adding to the projector according to the present invention suitable fixtures, it will be possible to also project images which are not derived from an inert object, for example moving images derived from any desired types of slow-motion films.

According to a preferred embodiment, the main dimensions of the subject projector can be as follows: depth 25 cm, height 60 cm, width 60 cm, and accordingly very small and suitable, due to the small weight of the used material, to be used in an intimate contact relationship with the shop glass windows; these dimensions, on the other hand, as well as the used materials, can be modified according to requirements, as well as the constructional details can be replaced by other equivalent elements

without departing from the scope of the invention, as disclosed and illustrated, and which will be defined by the following claims.

**CLAIMS**

1. A virtual threedimensional image projector for projecting virtual threedimensional images through the air, characterized in that said projector comprises a reflecting surface (DIOPTER) for reflecting to the outside a positive image of an object obtained by simultaneously illuminating said object by two concentrated dispersion free coherent light sources, said reflecting surface and said light sources being arranged on the top of an object holder recess.

2. A virtual image projector according to Claim 1, characterized in that said reflecting surface (diopter) comprises a vacuum thermoformed dome element (1), preferably though not exclusively made of a brilliant black A.U. polystyrene, having a mirror-like inner surface defining a quarter of sphere parabola, said light sources comprising halogen lamps having preferably a power of 20 watts each, each being provided with a diacropic parabola, and being simultaneously power supplied under a phase resonance condition by an electronic transformer having preferably a power of 60 watts.

3. A virtual image projector according to Claims 1 and 2, characterized in that the dome (1) includes therein molded recesses (2 and 2a) for said lamps and being superimposed on and operatively coupled to an underlying object holding recess (1a) including means for supporting and possibly moving said object the image of which must be projected.

4. A projector according to Claims 1 to 3,

characterized in that in front of the diopter reflecting surface, comprising said dome (1), a transparent diaphragm is provided.

5. A projector according to the preceding claims, characterized in that the full construction thereof comprises a holding body subdivided into two operating regions, preferably made of an opaque black A.U. polystyrene, the top portion whereof is constituted by a dome (1) having an inner reflecting surface (diopter) provided with recesses (2, 2a) for housing therein said lamps, the bottom portion defining an object holder recess inside which are arranged said support for said object to be illuminated, said optional motor for driving said support, said transformer and other optional components.

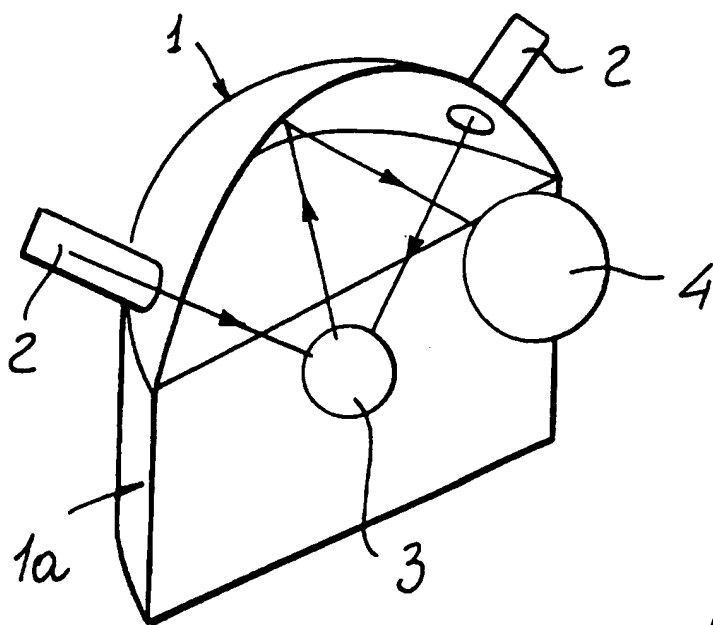


FIG. 1

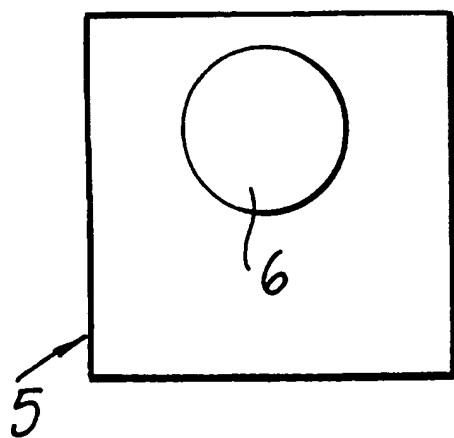


FIG. 3

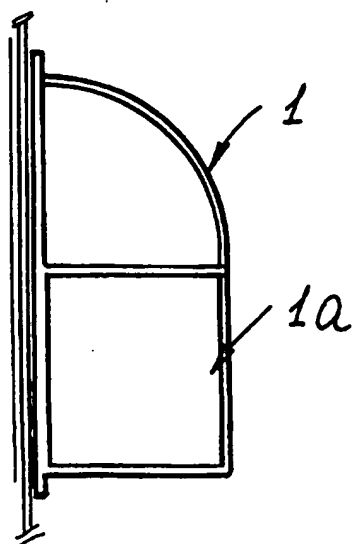


FIG. 2

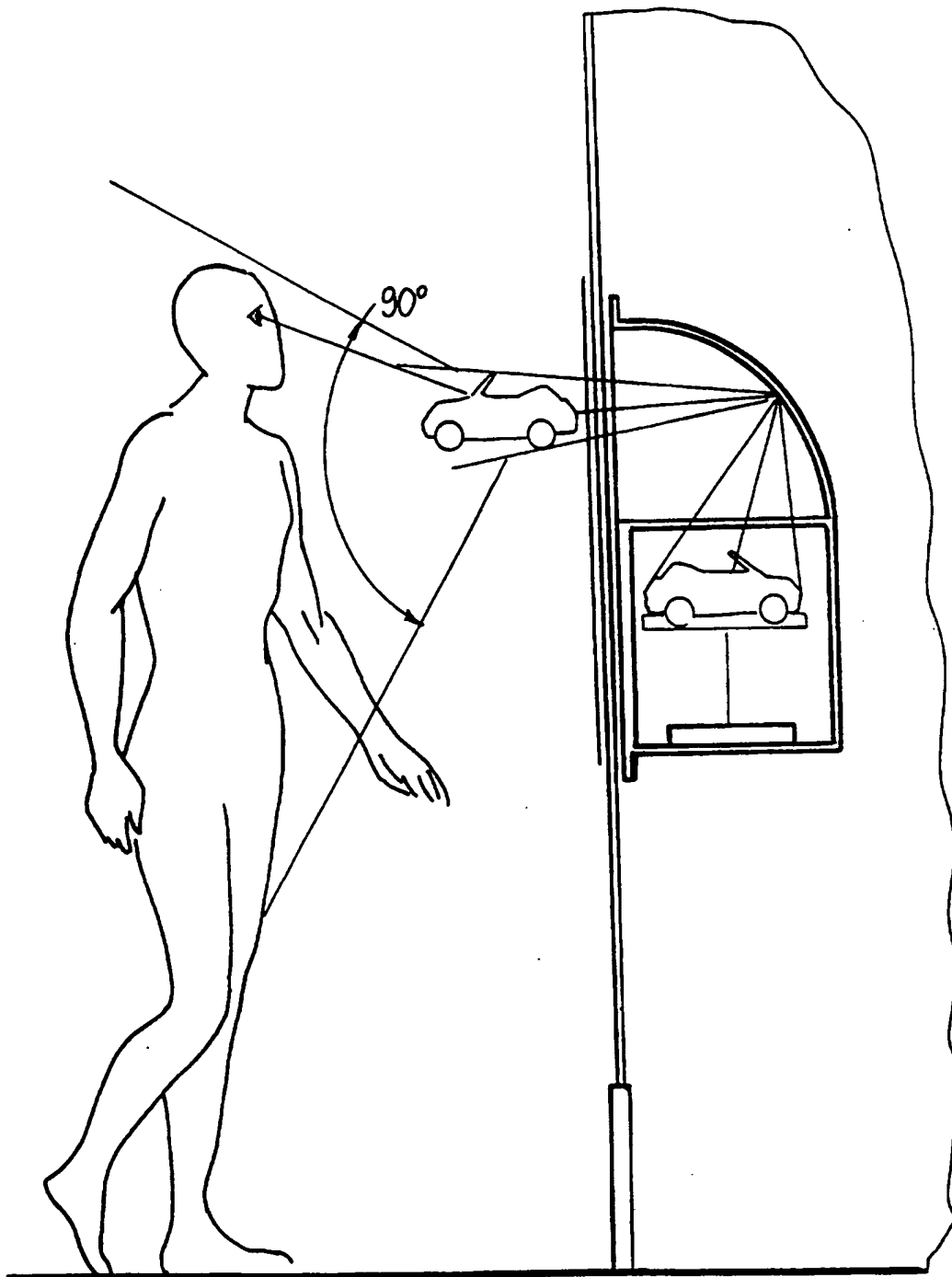


FIG. 4

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IT 96/00014

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G09F19/16 G02B27/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G09F G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                  | Relevant to claim No. |
|------------|---|-----------------------|
| Y          | DE,A,42 28 451 (B. KATZ) 3 March 1994<br>see the whole document<br>---                              | 1,5                   |
| Y          | DE,A,42 02 303 (B. KATZ) 29 July 1993<br>see column 2, line 38 - line 48; claims;<br>figures<br>--- | 1,5                   |
| X          | US,A,3 096 389 (L. DUDLEY) 2 July 1963<br>see the whole document<br>-----                           | 1,4,5                 |

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Date of the actual completion of the international search

5 September 1996

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# INTERNATIONAL SEARCH REPORT

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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| DE-A-4202303                              | 29-07-93            | AU-B- 3452193              | 01-09-93            |
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